

OVERCOMING GAS DETECTOR FAULT ALARM DUE TO MOISTURE

By

NUR MALISSA BINTI NASARUDDIN

FINAL PROJECT REPORT

Submitted to the Electrical & Electronics Engineering Programme
in Partial Fulfillment of the Requirements
for the Degree
Bachelor of Engineering (Hons)
(Electrical & Electronics Engineering)

Universiti Teknologi Petronas
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

© Copyright 2009
by
Nur Malissa Binti Nasaruddin, 2009

CERTIFICATION OF APPROVAL

OVERCOMING GAS DETECTOR FAULT ALARM DUE TO MOISTURE

by

Nur Malissa Binti Nasaruddin

A project dissertation submitted to the
Electrical & Electronics Engineering Programme
Universiti Teknologi PETRONAS
in partial fulfilment of the requirement for the
Bachelor of Engineering (Hons)
(Electrical & Electronics Engineering)

Approved:

Dr Irraivan Elamvazuthi
Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK

December 2009

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

Nur Malissa Binti Nasaruddin

ABSTRACT

The issue of plant explosion due to gas leakage is a serious problem which impacts the lives of the personnel, damages plant equipments and requires high cost for maintenance. As this issue is a high risk at hazardous place such as combustible gas plant, so there is an important need for using gas detector which functions to detect gas leakage at a particular area. However, some gas detectors are less reliable in detecting gas due to presence of other unwanted elements which may cause the instruments to malfunction. The objective of the project is to eliminate those unwanted element in order to maintain the well functioning of the instrument. The report discusses the Infrared signal absorption by combustible gas and solution to eliminate moisture trapped in gas detector.

ACKNOWLEDGEMENTS

All praised to Allah, Lord of the worlds, who, through His mercy and grace, has revealed some of His knowledge to the author in finishing this project. Verily all good are from Allah and all shortcomings are due to the author own weaknesses.

The successful completion of this project has been made possible through help and support of many individuals. First and foremost the author would like to thank Universiti Teknologi PETRONAS for supporting this work. The author also would like to extend deepest appreciation to her project supervisor, Dr Irraivan Elamvazuthi, who has graciously accepted her as her Final Year Project student, without which this project would not be possible in the first place. His attention and assistance have encouraged the author to put extra effort in finishing this project.

Many thanks and appreciation also goes to all technicians, especially Puan Hawa who always be there to help the author during the project execution. A big thanks for Puan Hawa advice and guidance too. Finally, the author would like to show her gratitude to all of author's friends who always help and support her throughout this project. The associations that the author has made during this project will truly be memorable for years to come.

TABLE OF CONTENTS

LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix
CHAPTER 1 INTRODUCTION	1
1.1 Background of Study.....	1
1.2 Problem Statement	1
1.3 Objectives and Scope of Study.....	2
1.3.1 Objectives	2
1.3.2 Scope of Study	2
CHAPTER 2 LITERATURE REVIEW	3
2.1 Differences of Infrared and Catalytic Type Gas Detector.....	3
2.2 Operational Principles	4
2.3 Hazardous and Flammable Gas.....	5
2.3.1 Flammable Limit	5
2.3.2 Flammable Gas Properties	6
2.3.3 Unique Gas Absorption “Fingerprints”	6
2.4 Infrared Radiation (IR).....	8
2.5 Liquefied Petroleum Gas (LPG)	9
2.6 Heating Element.....	10
CHAPTER 3 METHODOLOGY	11
3.1 Procedure Identification	11
3.2 Tools used in the Project	11
3.3 Project Prototype	13
CHAPTER 4 RESULTS AND DISCUSSION	19
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	22
REFERENCES	23
APPENDICES	24
APPENDIX A CROWCON NIMBUS DATASHEET.....	25
APPENDIX B PROPERTIES OF LPG-PROPANE BUTANE.....	26
APPENDIX C PROJECT GANTT CHART.....	27
APPENDIX D IC NE555 TIMER DATASHEET	28

LIST OF TABLES

Table 1 Differences of Infrared and Catalytic Type Gas Detector	3
Table 2 Near, Mid and Far Infrared	9
Table 3.1 Tools Used with Direct Cost.....	12
Table 3.2 Tools Used with Indirect Cost	12
Table 4 Experiment Results with Presence of Gas Leakage.....	19
Table 5 Experiment Results with Presence of Moisture	20
Table 6 Project Results.....	21

LIST OF FIGURES

Figure 1 Operating Principles of Crowcon Nimbus Model	4
Figure 2 Infrared Spectra for Propane and Butane.....	7
Figure 3 Electromagnetic Spectrum.....	8
Figure 4 Sequential Procedures to be Followed Throughout the Project	11
Figure 5 Gas Detector Basic Prototype	13
Figure 6 Gas Detector Prototype with the Heating Element and Additional Chamber	14
Figure 7 Heating element	14
Figure 8 Infrared emitter and detector circuit diagram	15
Figure 9 Alarm circuit diagram	15
Figure 10 Gas Detector Basic Prototype with the Heating Element and alarm circuit.	16
Figure 11 Gas Detector Prototype with Chamber	17
Figure 12 Liquefied Butane Cartridge	18